

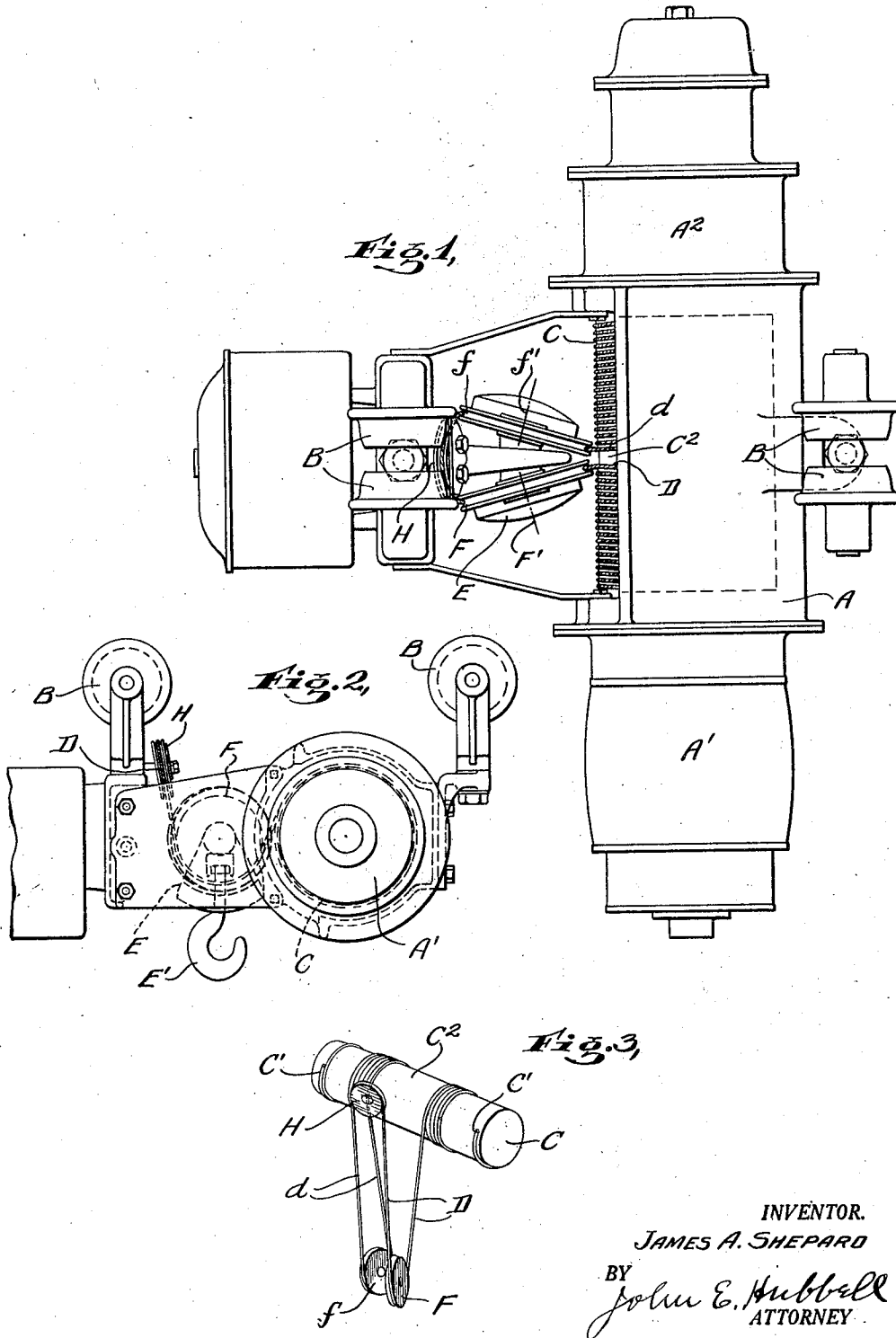
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CRANE HOIST

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## UNITED STATES PATENT OFFICE

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## CRANE HOIST

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My present invention relates to hoists, and particularly to hoists of the type in which two cable elements extend separately from a winding drum to a support or anchorage, and form loops, each of which passes about a corresponding pulley, the two pulleys being each journaled in the same load supporting pulley block frame. In such a hoist it is the regular practice to fasten the ends of the two cable elements to the winding drum at points adjacent the opposite ends of the drum, and to cause the portion of each element wound about the drum when a load is raised, to assume the form of a helix, the convolutions of each helix approaching those of the other as the load raising operation proceeds.

The object of the present invention is to provide a hoist of the type described with a pulley block so constructed and disposed as to permit the convolutions or coils of the two cable elements wound about the drum to come closer to one another when the pulley block is in its uppermost position, than has heretofore been practically possible in such a hoist. A practically important result of thus reducing the minimum distance between the adjacent coils of the two cable elements, is a reduction in the winding drum length required to wind up given lengths of cable elements, or stated differently, an increase in the cable winding capacity of a winding drum of given dimensions.

For reasons hereinafter explained, the minimum distance between the adjacent convolutions of the two cable elements wound about the winding drum depends upon and is approximately equal to the distance between the cable receiving grooves of the pulley wheels at the sides of the latter adjacent the winding drum when the pulley block is in its uppermost position. In accordance with the present invention, I reduce the last mentioned distance by mounting the two pulley wheels of the load supporting block to turn about axes which are not coincident as has heretofore been customary, but which are oblique to one another so that the sides of the two pulley wheels which are adjacent the winding drum when the block is in its upper-

most position are closer to one another than are the diametrically opposite sides of the pulley wheels.

A further advantage of the invention arises from the fact that the distance between the said opposite sides of the two pulley wheels depends in part upon, and may be varied by varying the inclination of the axes of said wheels to one another, and in consequence, with the present invention it is practically feasible to make said distance such that the anchorage for the ends of the cable elements remote from the winding drum may comprise an equalizing pulley of amply large diameter. The use of an equalizing pulley anchorage is common, but heretofore in many cases it has not been practically possible to use an equalizing pulley of as large diameter as is desirable.

The various features of novelty which characterize my invention are pointed out with particularity in the claims annexed to and forming a part of this specification. For a better understanding of the invention, however, and the advantages possessed by it, reference should be had to the accompanying drawings and descriptive matter in which I have illustrated and described preferred embodiments of the invention.

Of the drawings:

Fig. 1 is a plan view of a hoist;

Fig. 2 is an end elevation of the hoist shown in Fig. 1 with parts broken away; and

Fig. 3 is a diagrammatic perspective view showing the hoisting drum, pulley, cable, and cable equalizer arrangement.

In the drawings I have illustrated the use of the present invention in conventionally illustrated hoist A of well known type. The hoist A shown comprises framework adapted to be suspended from a track rail (not shown) through trolley wheels B, and in which is mounted a hoist winding drum C, and its driving motor A', and braking mechanism A<sup>2</sup>, respectively. Associated with the winding drum are two cable elements D and d, each of which has one end attached to the drum C, the points of connection, C', for the two elements being adjacent the opposite ends of the drums as shown in Fig. 3. The

opposite end of each cable element is connected to the hoist framework at a distance from the drum C depending generally upon the size of the pulley wheels F and *f*. The latter are mounted in the load supporting pulley block frame E, and are supported by loop portions of the cable elements D and *d*, respectively, depending from the hoist framework and winding drum.

In practice the cable elements D and *d* are ordinarily sections of wire rope, but of course I may use equivalents for wire rope, such as chains and hempen ropes. While the cable elements D and *d* may be entirely separate from one another and may have their ends remote from the winding drum C separately connected to the hoist framework, in common practice the elements D and *d* are formed, as shown, by integrally connected end to end sections of a single cable having its central portion connected to the hoist framework, by looping it about an equalizing pulley H pivotally supported by the hoist framework to turn about an axis extending above and transversely to the drum C. As the winding drum C is rotated to raise or lower a load supported by the pulley block hook E', portions of the cable elements D and *d* are wound about or unwound from the drum C, and the lengths of the cable element loops supporting the pulley wheels F and *f* are correspondingly shortened and lengthened. Ordinarily the drum is formed with spiral grooves at its periphery to insure the proper helical disposition of the cable element convolutions or turns encircling the drum, and in any event the length of the unwound central portion C<sup>2</sup> of the drum decreases and increases as the load is raised and lowered.

In accordance with the present invention, however, the pulley wheels F and *f* are mounted in the frame E to turn about axes F' and *f'*, respectively, which are so inclined to one another that the sides of the pulley wheels adjacent the winding drum C are closer together than are the opposite sides of the pulley wheels as is clearly shown in Fig. 1.

In consequence of this oblique pulley axis arrangement, it is possible to have the adjacent convolutions of the cable elements D and *d* wound about the winding drum C come closer to one another, when the pulley block is in its most elevated position, than has been heretofore possible. The decrease in winding drum length required for a given cable winding capacity thus made possible by the use of the present invention, may be explained as follows. To minimize cable and pulley block stresses the cable element portions between the pulley wheels F and *f*, and the winding drum C should each extend in an approximately tangential direction from the winding drum and from the corresponding pulley wheel. When the pulley block

reaches its most elevated position, shown in Figs. 1 and 2, the lengths of the portions of two cable elements D and *d* between the pulleys F and *f* and the drum C become very short, and said portions must then be approximately parallel with one another to approximate the desired tangential relation with the winding drum and pulley wheels. This requires that when the pulley block is in its most elevated position, the length of the unwound central portion C<sup>2</sup> of the drum C should be approximately equal to the distance between the cable receiving grooves in the pulley wheels F and *f* at the sides of the latter from which the cable elements pass to the winding drum. A decrease in the last mentioned distance thus increases the effective cable winding capacity of a winding drum of given diameter and length.

When the pulley block is lowered as shown in Fig. 3, from its uppermost position, the distance between the adjacent coils of the portions of the cable elements D' and *d'*, respectively, wound about the winding drum C increases, but since the length of the cable element sections extending between the winding drum and the pulleys is correspondingly increased, the desired approximately tangential relation is not impaired.

To minimize cable and pulley block stresses, the cable elements between the pulley wheels F and *f*, and the pulley wheel H should pass tangentially or approximately so, from each of the pulley wheels, and, in addition, the radius of curvature of the portion of the cable in contact with the pulley H should not be unduly small. Heretofore, with the pulley wheels of the load supporting pulley block parallel to one another, designers, in an endeavor to reduce the length of the unused central section of the winding drum, have commonly sought to bring the two pulley wheels of the pulley as close together as was practically possible. In consequence, there has been a tendency to make the diameter of the equalizing pulley so small as to bend the cable section looped about it more sharply than is desirable. With the present invention, there is no occasion for such tendency, since the sides of the oppositely inclined pulley wheels F and *f* remote from the winding drum, may readily be separated as widely as is required to accommodate, or correspond to a diameter of the equalizing pulley H as large as may be practically desirable.

While in accordance with the provisions of the statutes, I have illustrated and described the best form of embodiment of my invention now known to me, it will be apparent to those skilled in the art that changes may be made in the form of the apparatus disclosed without departing from the spirit of my invention as set forth in the appended claims and that in some cases certain features of my inven-

tion may be used to advantage without a corresponding use of other features.

Having now described my invention what I claim as new and desire to secure by Letters Patent, is:

1. In a hoist comprising a winding drum and two cable elements each having one end connected to an anchorage and having its opposite end connected to said winding drum at a point displaced longitudinally of the drum from the point at which the other element is connected to the drum, and in combination therewith a pulley block comprising a frame and two pulley wheels, one of which is supported in a looped portion of one of said elements extending between its anchored end and the winding drum, and the other of which is supported by a corresponding looped portion of the other cable element, said pulley wheels being journaled in said frame to turn about axes so inclined to one another that the sides of said pulley wheels from which the respective cable elements pass to said winding drum are closer together than are the sides of said wheels from which said elements pass to said anchorage.

2. In a hoist comprising a frame winding drum journaled therein, an equalizing pulley wheel also journaled in said frame and a cable having its ends connected to said winding drum each at a point displaced longitudinally of the drum from the point at which the other element is connected to the drum, and having an intermediate portion looped about said equalizing pulley wheel, and in combination therewith a pulley block comprising a frame and two pulley wheels one of which is supported in one and the other of which is supported in the second of the two looped portions of said cable extending between the opposite sides of said equalizing pulley wheel and said winding drum, said two pulley wheels being journaled in said frame to turn about axes so inclined to one another that their sides from which cable portions pass directly to said winding drum are closer together than are their sides from which cable portions pass directly to the opposite sides of said equalizing pulley wheel.

Signed at New York city, in the county of New York and State of New York this 6th day of July, A. D. 1928.

JAMES A. SHEPARD.